

SCIENCE.

FRIDAY, OCTOBER 28, 1885.

COMMENT AND CRITICISM.

IT IS REPORTED that the President has virtually decided to postpone the appointment of the superintendent of the coast and geodetic survey until after the meeting of congress. This, if true, will be regretted by all interested in the survey, as it is essential that when congress assembles there shall be some one to speak with authority about the needs and work of the survey. As the matter now stands, congress will have no one to look to for a policy.

AN INTERESTING DISCUSSION took place at the meeting, October 9, of the Naval institute at Annapolis on the subject of arctic exploration. C. R. Markham, of the Royal geographical society, presided, and the essayist of the evening was Lieut. J. W. Danenhower of the Jeannette expedition. The point of the paper was the inadvisability of further arctic exploration, and the speaker declared himself as definitely opposed to further exploration of the polar region bounded by the 85th parallel. He considered that geographical discovery is not of sufficient importance to warrant exposure to the dangers to be encountered there, and that there is no special reason for supposing that the meteorological phenomena of the polar region differ essentially from those which may be observed near its borders. The paper was supplemented by others received from Chief engineer Geo. W. Melville, U.S.N., Sir Geo. Nares, and Lieutenant Greely, and verbally discussed by Dr. E. Bessels of the Polaris expedition, and Mr. Markham. Letters in favor of further arctic exploration were read from Prof. J. E. Nourse, U.S.N., and Dr. H. Rink, formerly governor of the Danish colonies in Greenland.

The tenor of the discussion, generally, was to the effect that, while it might be admitted that further exploration could not be justified on utilitarian and commercial grounds, nevertheless, without reference to scientific results, the world could not but gain by the examples of determination and heroism which arctic exploration may be counted on to develop in the future, as it has done in the past, that

individuals and nations cannot afford to gauge their endeavors by a merely commercial standard; and, last, that in regard to the facts of terrestrial physics to be determined by arctic exploration, the essayist had come to an unwarranted conclusion. The latter view was especially insisted on in a vigorous and comprehensive statement by Mr. Markham.

There can be but one opinion among men of science in regard to a certain sort of arctic expedition. A vague 'patriotic' impulse to plant the flag of any given country at the pole, taken by itself, is no more entitled to respect than is the motive which prompted the wanderings of 'Sergeant Bates' over regions generally accessible. An expedition fitted out for mere glory, without any definite scientific object or well matured and clearly understood plan, officered by men whose courage, enthusiasm and inexperience are their only qualifications, is in no respect to be commended. Such expeditions have had their share of the glory they sought, and have contributed an enormous proportion to the total of arctic disaster. It is to be hoped that there will be no more of them, in spite of the fact that they have also contributed something to the common stock of knowledge. Scientific exploration of the arctic regions will go on. Like other undertakings which depend for the sinews of war upon national or individual interest and liberality, it will have its periods of activity and of inaction. But that the crown of the sphere shall be left to solitude and the auroras, while science with her questions and man with his ambitions coexist upon this planet, is a proposition requiring no refutation.

THE NECESSITY OF PAYING greater attention to the study of geography in its widest sense is gradually becoming admitted in European countries. The *Revue de géographie* cites, with appropriate comments, a recent discussion in the French senate on this subject, by M. Bardoux, formerly Minister of public instruction, and M. Goblet, at present holding that office. In brief, the former called attention to the need of more and better geographical teaching, both in Paris and the provinces, and to the isolation of the present teachers. He urged

the creation of more professorships and the propriety of combining their forces into a national faculty, institute, or school, of advanced geographical teaching. In this way no additional expense would be required, and yet the work might be more effectively carried on.

The minister in replying evinced his sympathy with the view that geography was growing daily more important and should be more widely taught. He declared his desire for more numerous chairs of that science, and that it should be taught more effectively, but doubted whether it were desirable that any centralized body should undertake instruction of that science separately, evidently believing that it should be taught in conjunction with other branches of learning. He also pointed out that much progress had already been made. Four professorships of geography have been created since 1870, and more than ten others combine history and geography, besides which there are several courses of lectures on geographical subjects. M. Drapeyron, the editor of the review, is devoted to the project of a national school of geography, and has constituted himself its apostle in France. By geography is, of course, meant 'knowledge of the earth' in its widest sense, and not merely a smattering of political divisions, large towns and the most salient physical features, mixed with a little history, ethnology, architecture and cartography, which passes muster for the science of geography in most of our schools.

Great Britain has recently been stirring in the matter of geographical teaching, and, though this country has benefited greatly by the work and presence of such men as Guyot and Maury, and by the constant progress of actual exploration, which has made certain aspects of geography familiar to the public mind, yet even here the teaching of this science leaves much to be desired, and it is not yet, we believe, recognized by a full professorship in any of our universities.

ASTRONOMERS AT MOST observatories must envy those at Nice their clear skies. M. Charlois of that observatory was the first to pick up Tuttle's comet at its late return, and, although it was only possible to observe it for ten or fifteen minutes each morning, between its rising-time and twilight, yet, in spite of its faintness, nearness to the horizon, and this limited time, he was able to compare its

position with that of neighboring stars on six consecutive days after discovery, thus furnishing plenty of data for fixing the time of perihelion passage and correcting the elements of its orbit, even if no other observations are secured at this return. The same observer also obtained good observations of Barnard's comet on the seven consecutive nights following the telegraphic announcement of its discovery. These are records that could be made at very few places outside the sunny skies of southern France and Italy.

THE RELATIVE IMPORTANCE of astronomy and meteorology, as looked upon in some parts of the world, is well illustrated in a volume just published whose title page reads: "Meteorological observations made at the Adelaide observatory, and other places in southern Australia and the northern territory, during the year 1882, under the direction of Charles Todd, C. M. G., F. R. A. S., observer, postmaster-general, and superintendent of telegraphs." The volume is a folio of 298 pages, of which all but two are devoted to meteorology. These two describe the astronomical work of the Adelaide observatory for 1882, the first being devoted to the observation of ten phenomena of Jupiter's satellites, of which only two are eclipses, the phenomena timed in these cases being described as 'first seen,' 'quite distinct,' and 'full blaze.' The other page is devoted to the director's observations upon the transit of Venus of December 7, made at Wentworth. The description of the determination of the latitude of the observing station is worth quoting. "The latitude, deduced from eleven meridian altitudes, kindly taken with a sextant by Mr. J. W. Connolly, surveyor, is $34^{\circ} 6' 24.7''$."

THE ALERT EXPEDITION.

THE steamer *Alert*, Lieutenant Gordon, R. N., commanding, arrived at St. John's, N. F., Oct. 14, from her second attempt to reach Hudson Bay, having visited all the stations where observers had been placed in 1884, relieving the parties and supplying their places by fresh observers. All were well, only one death, that of a station hand by scurvy, having been reported. One of the stations was found deserted, but the party, fearing the *Alert* might not reach them, had taken passage on the Hudson Bay company's steamer *Labrador*. The results of work at the stations have been favorable, though exact details have not yet been received. The *Alert* reached her destination

without difficulty, and those most interested in the route by Hudson Bay to Europe for the wheat of Manitoba, are enthusiastic in their assertions that this proves the practicability of the route. A sober second thought, however, would indicate that, as far as yet made public, absolutely nothing new has been learned on the voyage of the Alert. The character of the navigation of Hudson Bay, a great shoal inlet, with its bottom dotted with stupendous boulders often rising nearly to the surface; with no good port in the southwest, where, at the best anchorage, the vessel lies eight or nine miles from what must be the shipping point, permanent piers of any length being out of the question, owing to the movements of the ice; a strictly arctic climate, constant mirage, and no charts of any value: these incidents of the plan do not seem to be affected by anything done on the voyage as far as yet known.

USE AND ABUSE OF LEARNED SOCIETIES.

EVERY country thinks, doubtless, when it looks at the peculiar way in which things are done in other countries, that it could devise a method of much more dignity and wisdom for carrying out its purposes. We may certainly be excused for thinking that the plans by which great men are selected in both England and France might be improved upon. The familiar story of the candidate for the fortieth arm-chair of the French academy going about and soliciting the votes of thirty-nine immortals, never fails to give one an unpleasant shock at every fresh hearing. Even our presidential candidates are considered to be deficient in dignity when they make public speeches in their own behalf, and the literary man is supposed to be a man of much more delicate feeling than any politician. Nor is the English way of granting admission into the Royal society at all to be preferred; to hold an actual competitive examination, on the result of which a certain number of successful candidates are annually chosen, is not to show deference to the feelings of the candidate any more than the French have done.

There is a simple principle that should guide the bestowal of honors,—it is that they should be given and not sought. In private life a man is not expected to press his merits or his company upon his friends. We should consider it a barbarous social etiquette in which a person was required to call upon all his acquaintances and beg to be invited to their choicest dinners. If rewards are to

be given at all for distinction in science or in letters, they should be given freely, and not be made bitter by conditions to which a gentleman has never before been obliged to submit. It may be a difficult matter to make the proper choice, but, at least, it should be made without the assistance of the candidate himself.

The English method has the additional disadvantage that it does not secure the men whom it is most desirable to honor. During the school-boy period, the distinction between different individuals is a distinction of learning, and an examination is not unfitted to discover the boy who deserves reward. But learning is not the quality which a state needs to make it great. Casaubons are not the kind of men who have built up English science. The qualities which ought to be encouraged, and which it should be a nation's delight to honor, are qualities too subtle to be detected by a competitive examination. That is a way of dealing out honors which, as Professor Chrystal has just said before the British association, belongs to the pupillary age both of men and of nations.

In our own national academy, whose tender age forbids as yet the lustre that clings to the ancient institutions of the European capitals, the only knowledge a man may have that he is a candidate for election is through the imprudence of his friends among the academicians,—an imprudence which is unhappily too common. Indeed it is becoming evident to many that the candidate active in pushing his own claims, in however secret a manner, is *pro tanto* lessening his chances of admission. And this is as it should be; merit in the eyes of others should be the single test.

THE RECENT EDUCATIONAL MEETING IN BOSTON.

THE educational conference, which met on Friday and Saturday, Oct. 16 and 17, at the Boston Latin school, was one of the most notable ever held in America, by reason of the representative character of the delegates, the nature of the topics discussed, and the possible effect upon our higher education of the movement there inaugurated.

The teachers of the preparatory schools have for some time been conscious of certain difficulties arising from the lack of a proper understanding on their part of what the colleges really desire of them, and particularly as regards the requisitions for admission to college, in the determination of which, they, however interested parties, have never been recognized as having a voice. Addi-

tional subjects have been added from time to time to the requirements, additional quantities also in the traditional subjects, while each college has more or less contributed to the diversity of the programme submitted to the preparatory schools.

Those unsatisfactory relations were the subject of a very frank discussion at the meeting of the Massachusetts classical and high school teachers association in 1884. Resolutions were passed setting forth the desirability of a meeting of delegates of that body with representatives of the New England colleges to consider matters of common interest, and at the following meeting, in April, 1885, a committee was appointed to make arrangements for such a conference.

The response of the colleges was most cordial, as may be inferred from the fact that fourteen colleges were represented at the recent meeting, and eleven of these by their presidents. Nearly every one of the leading academies which fit for college, as well as many of the public high schools of the larger New England cities and towns, were also represented by their principals.

The programme of the meeting involved the presentation of only four papers, with a discussion of each. Two of these were prepared by persons connected with colleges and two by preparatory teachers, and in each instance the discussion was opened by a delegate representing the alternate interest. From the side of the colleges, President Porter of Yale spoke on the question, 'How can the preparatory schools coöperate more effectively with the colleges?' and Professor Fay of Tufts college had prepared an answer to the query, 'What are some of the most prominent and prevailing defects in the preparation of candidates for college?' the material cited in evidence being collated from nine leading colleges. The questions, 'Is any greater degree of uniformity in the requisitions for admission to college practicable?' and, 'Under what conditions might admission to college by certificate be permitted?' were treated respectively by Principal Bancroft, of Phillips academy, Andover, and Dr. Robert P. Keep of the Free academy, Norwich, Conn., while the discussions on these topics were opened by President Eliot of Harvard and President Robinson of Brown university.

The papers were characterized by the completest frankness, and the evils which stand in the way of a consistent, consecutive, and honest national system of education, were unflinchingly faced. The representatives of the colleges were given a clear understanding of the practical difficulties they created for the fitting schools, while the teachers of those schools learned, perhaps for the first time, just how the products of their efforts

are regarded by the college professors, into whose hands they are committed for a continuance of the work begun by them. The showing was anything but gratifying to our national vanity, for the fact was not overlooked that the colleges find it hardly possible to correct the careless or lazy intellectual habits contracted in the preparatory schools. On the other hand, the colleges were held responsible for the larger part of the evil, owing to the excessive burden put by them upon the schools. The traditional absurdity of setting quantity above quality in the requirements for admission to college was boldly criticised, and hopes were expressed that some plan, that will prove satisfactory to all parties, may yet be devised for admission of students upon the certificate of competent teachers that they are prepared to pursue a collegiate course with profit.

If any came to the meeting skeptical as to any practical results of a conference of two classes of teachers, whose work, however naturally a unit, has thus far been conducted in entire independence, the one part of the other, he must have been happily disappointed. When one considers the staleness of the subjects usually treated at educational meetings, the threshing of old straw, and the half-dreariness of the interest manifested in many cases by the leaders, the freshness and enthusiasm of the conference were something worthy of especial comment. While to the college men certain of the subjects were perhaps commonplace, they came with a degree of freshness to the teachers of the schools; and so, on the other hand, it was something quite new for the presidents and professors to hear clearly voiced the sentiments of the preparatory teachers, of which they had heard only vague echoes. Hence, when the programme of papers and discussions was ended, the conference, with an eager unanimity, resolved itself into a permanent organization, to be known as the 'New England association of colleges and preparatory schools.'

The first practical result of the conference was the passage of the following resolutions with regard to uniformity of requisitions:

First,—Resolved, That this conference of college presidents, principals and teachers in preparatory schools, earnestly appeals to the colleges for concerted action on their part in order to secure uniform requisitions in all subjects and authors in which they have a common requirement.

Second,—Resolved, That this conference urge upon the colleges a still closer agreement on their part as to the subjects to be set for examination, the recommendations to be made to the schools, and the nature and extent of the entrance examinations.

Third,—Resolved, That this conference request the colleges to make reasonable announcement of any changes in the requirements for admission.

Fourth,—Resolved, That this conference request the colleges to unite in prescribing definitely the subjects which may be offered at the partial or preliminary examinations, the minimum number for which a certificate will be given, and to decide whether a final examination may be converted in any case into a preliminary examination, or a preliminary examination into a final examination, and if so, on what terms.

Fifth,—Resolved, That this conference urge upon the colleges coöperation and comity, either in accepting each other's certificates of examination, or in establishing jointly an examining board, whose duty it shall be to set papers, conduct examinations, and issue certificates on their behalf, which certificates shall be good in any college in the syndicate.

Naturally the public at large is not so directly interested in this particular subject of uniform requisitions as the preparatory teachers, but certain cognate topics of a general interest cannot fail to be considered in connection with this matter. First of all, and of the greatest importance in view of the very bad state of affairs shown by the paper upon prominent and prevailing defects in the preparation of candidates for college, the relative value of a thorough grounding in the elements of each of the subjects on which the candidate is required to be examined, as compared with the present superficial attempt to perform an excessive stint, cannot fail to be considered. Science cannot fail to derive a direct advantage from a change for the better in this particular. If, as it appears, inaccuracy and lack of intellectual independence are the striking defects noticeable among college students, any reform which shall tend to do away with such unscientific, as well as unscholarly deficiencies, will be of benefit in increasing the number of educated men from whom science has something to hope.

AN ADVANCE IN FISH CULTURE.

NOTWITHSTANDING the successes of fish culture in replenishing the depleted waters of our Pacific slope with quinnat salmon, those of the great lakes with white-fish, and the rivers of the east with shad, little has resulted from the efforts to restore *Salmo salar* to its native haunts in New England, or to acclimate it in the Hudson, the Susquehanna or the Potomac. The introduction of the quinnat salmon into Atlantic waters has as yet not been accomplished, and the attempts toward this end must be classed as experimental, rather than actual fish culture. In an infant art like fish culture, the only road to success is through scientific experimentation, and it is the freedom with which tentative work has been done by the U. S. fish commission, which has placed American fish culture so far in advance of that of the old world.

Experimental fish culture has frequently led to practical results in a manner not at all anticipated; never, however, more strikingly than in the recent salmon work in the basin of the Hudson. In 1883, through the coöperation of the U. S. commission with one of the commissioners of the state of New York, 40,000 fry of salmon were brought from the Penobscot and placed in Clendon Brook, near Glens Falls, N. Y. The brook was placarded and policed, and this fall it is found to be alive with young salmon throughout its entire length. There are numerous fish just ready to be transformed from 'parrs' into 'smolts'; these are about six inches long, and will, doubtless, soon go out to sea to return in about three years as adult salmon. There are also numerous smaller fish, representing the 60,000 fry which were planted in the same stream last April. The larger ones take the fly with great eagerness.

Heretofore, in planting salmon, it has been customary to place the little fish in the streams and allow them to care for themselves, but the new idea of placing them in protected preserves, where they can be cared for by the people living near at hand, and their growth to the proper size assured, will, no doubt, revolutionize salmon culture.

A similar experiment has lately been made at the station of the U. S. fish commission at Wytheville, Va., where 30,000 California trout have been confined until they have become vigorous fish of half a foot in length; they will be used, instead of helpless fry just freed from the yolk sac, in stocking the Atlantic slope with this fine species.

The conclusion of the Clendon Brook experiment will be eagerly looked for, not only by anglers and economists, but by zoölogists generally, to whom the extension of the actual habitat of a large river fish, some three degrees to the southward, will be a matter of considerable interest.

THE FLOOD ROCK EXPLOSION FELT AT HARVARD COLLEGE.

At a meeting of the American academy of arts and science, held in Boston, Oct. 10, Prof. W. A. Rogers, of the Harvard college observatory, gave an account of his observations to detect any trembling of the earth at the time of the Flood Rock explosion. Professor Rogers stated that at 11:17:30 by the chronometer a very decided commotion of the surface of the mercury was observed. About 15 seconds later the rumble of an ice wagon was heard at a distance of 1,000 or 1,300 feet from the observatory. From this instant the effects of the disturbance by the wagon and of the explosion were combined, but the disturbance

waves from the latter cause were so greatly magnified beyond anything he had ever before observed that he thinks there can be no reasonable doubt of their reality as the result of the explosion. A second and still more violent commotion was observed 10 or 15 seconds later, and a third even greater disturbance occurred about the same length of time following the second. At 11:18:15 A. M., the entire surface of the mercury under the objective appeared to sway back and forth over a space certainly as great as one five hundredth of an inch. This action continued eight or ten seconds, and at the end of about 20 seconds there was almost an entire subsidence of the commotion. From this instant the recurring disturbances gradually diminished, and at 11:20 A. M. they had entirely ceased. At this time the ice wagon was directly opposite the observatory.

The waves of disturbance certainly increased in amplitude until 11:18:15 A. M., and gradually diminished after that time. The intervals between the waves appeared to be about 15 seconds, but attention was not withdrawn to the chronometer to be accurate as to this. Professor Rogers is not quite certain whether there were three or four waves preceding the one having the greatest amplitude. The direction of the waves as indicated by the movement of the spot reflected on the mercury surface, was certainly not due east and west, but rather about 15 degrees from the north and south line; that is, north of east and south of west. On the next following day, by prearrangement with the driver, an ice wagon was started from about opposite the observatory, to be driven rapidly away. Under these circumstances, only a very slight tremor of the mercury surface was visible, while the cart was traversing a distance of about 750 feet, after which the tremor ceased. The readings of the chronometer were corrected to give eastern time, as above stated.

SOCIAL PHILOSOPHY AND RELIGION OF COMTE.

THIS is one of the ablest works of the well-known author, and is a decidedly agreeable indication of the spirit just now prevalent in the better sort of philosophical discussion. When the British Hegelian movement began, a score of years ago, with Dr. Stirling's 'Secret of Hegel,' it was on its face an intolerant and exclusive movement. As popular English thought had no organ for understanding the master, and merely felt that Dr. Stirling had 'kept his secret,' so the Hegelian leader himself expressed a bitter contempt for popular English thought, and mutual advantage

The social philosophy and religion of Comte. By EDWARD CAIRD, L.L.D. New York, Macmillan, 1885.

for the disputants seemed hopeless. The new Hegelianism looked like a new patent plan of salvation, with nothing to offer save to the faithful. Younger Hegelians in the British universities, equally learned in their chosen field, but less vain of their skill, have changed in latter days this forbidding exclusiveness. They have seen that a doctrine which pretends to be universal, cannot possibly be content with a merely scholastic intolerance and formalism. They have felt that if Hegelianism is of universal significance for human thought, it can be so only in case universal human thought is already in its actual essence, Hegelian, however unconscious the natural man may be of his discipleship. A system is of one sort when it says: "I express what you heretics shall become ere you shall escape from your natural and utterly lost state;" and of quite another sort when it says: "I express what you, as genuine human thinkers, already in your thought unwittingly are and aim to be." Now if there is any truth essential to genuine Hegelianism, it is that this latter attitude is the correct one towards the thought of any active and sincerely progressive age like the present. The Hegelian system pretends to have meaning only for an actual concrete world, and loses sense whenever it is presented as a remote plan of a purely abstract and ideal world. And so the healthy effort of the younger British Hegelians to drop Dr. Stirling's 'head-boy' airs, to cease boasting of the skill required for seeing through the Hegelian mill-stone, and to tell us a straight story about what human thought is and does, is an effort of a most gratifying sort. To be sure, this effort must not be confounded with any debased 'popularizing' of philosophical study, such as should overcome difficulties only by keeping them below the horizon. The more recent British Hegelian books and articles are not very easy reading. But they have a most stimulating air of actuality about them, and if Prof. Caird is not always so robust and direct in speech as some of his fellows, he at least shows a very sincere effort to continue his studious progress earthwards; and we may hope that he will ere long reach his goal.

This undertaking then, to show not that human thought must needs put on the Spanish boots of any man's terminology, but that the Hegelian doctrine has expressed profound truths about the unconscious spirit, and about the true meaning and work of all sound natural thought, is exemplified by Prof. Caird in the volume before us, by an application of his method to a criticism of Auguste Comte. Comte is, one would have supposed, at the other pole from Hegel. One would be amused to imagine them, in Walter Savage Landor fashion, engaged in conversation, or, better,

in Hades, like two characters in Lucian, possibly talking about this very book of Caird's, and vainly trying, with the tolerance suitable to disembodied spirits, to find out each what the other might be in the universe to do. They would hardly succeed so well as in this book Prof. Caird has succeeded for them. He has seen their close spiritual relationship, and has shown how much Comte's aim was like Hegel's. If in doing this he has rather delighted in reducing Comte to Hegel, than in trying to read Hegel in terms of Comte, the injustice, if it be such, is one natural to a disciple's nature, and also a necessary result of the fact that he has applied his criticism mainly to Comte's social philosophy. An equally thoughtful and tolerant Kantian critic, coming from his side with corresponding motives to the study of Hegel's *naturphilosophie*, would probably find no great difficulty in reducing whatever is significant in this part of Hegel to the terminology and to the thought of Comte.

But Prof. Caird is surely right in taking these two great thinkers to be expressions, unconsciously analogous, of the same great tendency. They both summed up the age of the reaction. In the temperaments of both smouldered the same repressed romantic fire, which each of them scorned in others, and could not destroy in himself. In each this same natural and suppressed sympathy with the romantic movement gave color to his results; each struggled with his temperament, and in each this struggle became his system. For philosophical systems, like all other products of devoted lives, are the results of inner personal conflicts of character. Hegel and Comte differed as Swabian from Frenchman; but their problems were much the same, and their results profoundly similar, beneath all the great external differences. Hence the concrete psychological interest of a book like the present.

There is no space here to go into the details of Prof. Caird's discussion. The book begins by pointing out the main elements both in the scientific and in the social philosophy of Comte. This part of the work is on the whole done very appreciatively. Then, in chapter ii., Prof. Caird begins his criticisms. Yet these criticisms are never merely destructive. The deeper sense of the doctrine is sought, and Prof. Caird easily finds, sometimes perhaps too easily, that where Comte was true to himself and to his problems, he was true also to essentially Hegelian principles. That Comte, for instance, in his hatred for what he called 'metaphysics,' stood in fact unconsciously on Kantian, and so on the Hegelian ground, is clear. That when Comte, after seeming to be a pure nominalist in his war with traditional relig-

ion and metaphysics, turns about and says: "Man is a mere abstraction, and there is nothing real but humanity," he comes upon decidedly Hegelian ground. "The defect," says Prof. Caird, "lies in the unconsciousness of his own metaphysic."

As chapter ii. is devoted to the negative or destructive side of Comte's doctrine, chapter iii. discusses the 'positive or constructive side,' including, in this, Comte's 'substitutes for metaphysic and theology.' Toward the end of the book, in chapter iv., on 'Comte's view of the relation of the intellect to the heart,' Prof. Caird seems to us to take his task too easily, and to content himself too frequently with inspiring but decidedly dark sayings. But here, very possibly, our failure to follow may be a matter of our own weakness in Prof. Caird's faith.

Prof. Caird's result assimilates very closely Comte's position in philosophy to that of Kant, namely, in so far as his thought was unconsciously, a germ out of which a positive idealism would have to grow if it were developed. "Also partly because he lived at a later time, and in the midst of a society which was in the throes of a social revolution, and partly because of the keenness and strength of his own social sympathies, he gives us a kind of insight into the diseases and wants of modern society, which we could not expect from Kant, and which throws new light upon the ethical speculations of Kant's idealistic successors." One has to believe, thinks Prof. Caird, that his system is 'inconsistent with itself' and that his historical and social theories are defective. But one finds him well worthy of study.

Let us add that one does not need to be an Hegelian in order to appreciate the skill and tolerance of Prof. Caird's book, and to find much that is deeply interesting, not only from a philosophic, but also from a purely psychological point of view, in this suggestion of strong mental and moral likeness under an external show of great diversity. In this sense, Prof. Caird has made a most helpful contribution to what we much need,—a psychological history of thought as a product of social and individual temperament.

RUSSIA UNDER THE TZARS.

READERS of 'Underground Russia' are familiar with the great fortress of Peter and Paul, famous as the place from which Krapotkin made his memorable escape, and they will recognize it here—not as an old friend—but as an old enemy. Not content, however, with a horrible description of the cruelties perpetrated in this place under the

Russia under the tzars. By STEPHANIE. Rendered into English by Wm. Westall. New York, Scribner's Sons, 1885. 12s.

sanction of the Czar's government, our author has shown us the interior of the other prisons to which political prisoners are sent, and has added a sketch of the life led by the suspects in exile. This occupies the middle of the volume, which opens with an account of the constitutional development of Russia—if it can be called development, when nearly all the movement has been backwards—and it is followed by a dry though useful description of the educational system of the country, written with a view to show its utter inadequacy. Stepniak, whose recent articles in the *London Times* on the present state of the Russian army are full of interest, possesses a talent for describing scenes of suffering and woe, which would have made his or her fortune if turned into the profitable channel of sensational novel-writing. But this same faculty prejudices his reader against him as the truthful narrator of scenes in actual life, and one puts the book down with a feeling that, after all, the author has been trifling with his sympathies.

JOHNSON'S SURVEYING.

THE method of ascertaining distances and elevations by means of the engineer's transit instrument and stadia—where the apparent length on a staff intercepted by two parallel wires in a telescope gives the distance of the staff from the instrument, and the vertical angle serves to determine the elevation—has not, as yet, become well established in private surveying practice, although no one who is well informed in such matters doubts its applicability to a large range of geodetic work, its accuracy and convenience.

The use of the stadia has been confined almost altogether to the U. S. and state surveys. The experience which Professor Johnson, of Washington university, St. Louis, gained while engaged on the surveys of the great lakes and the Mississippi River, has enabled him to prepare a very clear and concise manual of the operations of topographical surveying as there practised. He also gives a detailed description of the work of measuring a base-line and triangulating when the survey is of moderate magnitude, indeed for any work except the most important, and he explains the projection of maps for large and small areas.

The book is well suited to the class-room and the field. We should have preferred, however, to find his discussion of utility and universal applicability of the method placed in the introduction instead of the body of the text, or gathered

A manual of the theory and practice of topographical surveying by means of the transit and stadia; including secondary base-line and the triangulation measurements and the projection of maps. By J. B. JOHNSON, C. E. New York, Wiley, 1883.

into a note, for, when the reader is once assured of its reliability, he will be likely to feel that a manual is needlessly encumbered with such arguments.

NEW BOOKS.

. For full titles see 'Publications received at editor's office.'

'Aid to engineering solution' (Jackson) is intended to correspond with 'Aid to survey practice,' and to afford a succinct account of a simple general method of effecting engineering solutions, as well as to give a complete set of solutions useful to the engineer.—'Commercial organic analysis' (Allen) is the first volume of a revised edition, devoted chiefly to the consideration of bodies of the fatty series and of vegetable origin, and includes chapters on alcohols, ethers, and other neutral derivatives of the alcohols, sugars, starch and its isomers, and vegetable acids. The second volume is already on the press, and treats more especially of coal-tar products and bodies of the aromatic series, the fixed oils, and the products of their saponification; and the tannins will also be considered. It is proposed to devote a third volume to nitrogenized organic substances.—'Henfrey's English coins' (Keary) is a new edition of Henfrey's 'Guide to English coins,' with some corrections and enlargements, without any decided alterations in the form of the book.—'Silos for British fodder crops' (*The field*) is a third edition, the same as the last excepting that 48 pages have been appended to supply particulars respecting the ensilage competition of 1884.—'Mikroskopische reactionen' (Holtzendorff) is an attempt to bring together, for the use of chemists, reactions based on the crystalline form and optical qualities of substances, which can be used under the microscope.—'Spezial-karte von Africa' (Habenicht, Domann, and Lüddecke). This map, published by Justus Perthes in Gotha on the occasion of the centennial of the foundation of that house, is being made under the direction of Hermann Habenicht, Bruno Domann, and Dr. Richard Lüddecke. It will be published in ten parts on a scale of 1: 4,000,000.

GEOGRAPHICAL NOTES.

CHAFFAUJON writes from Ciudad-Bolivar of his recent journey to the upper Orinoco and Cauca rivers. He was accompanied by Indian guides, two from the Arigua tribe, an Arebato and a Guagnungomo, the latter belonging to a tribe feared for its valor and ferocity by all the people of the region. The party passed without difficulty as far as a little village near the Brazilian frontier, where

the Guagnungomo disappeared. This put the traveller on his guard, but, while rifling a burial place of the same tribe, he was suddenly attacked by a party of them, led by his former guide, who shot the Arebato fatally, but failed to wound Chaf-faujon. The latter killed the renegade, whose companions disappeared, but carried or drove off all the animals and equipment of the party, as well as one of the Ariguas. With the other, however, the traveller escaped and reached the Cauca, which he descended on a raft to Tremblador, where the authorities had arrived with a military party in search of him. It would seem that it was his intention to return to Europe before long.

The U. S. revenue cutter Corwin arrived in San Francisco from the arctic, October 12. She brought with her the party sent out by General Miles last year to explore between the Copper and Yukon rivers. They were Lieut. H. F. Allen and Sergeants Robertson and Ficket of the Army signal office. They had crossed from the headwaters of the Atnah River to those of the Tananah, descended the latter to the Yukon, and the Yukon to the sea, accomplishing a most creditable journey, and one which a previous military party under Lieut. Abercrombie had failed to carry out. A considerable part of it was over an unexplored region. Messrs. Garland and Beatty, two English travellers who had crossed from the Mackenzie to the Yukon and descended the latter, were taken up with the American party at St. Michael's and brought to San Francisco. The Corwin also brought the crews of the Napoleon, the George and Susan, and the Mabel, three whalers lost this season in Bering Sea and the arctic. We have referred previously to the loss of the Napoleon; the two others appear to have been blown ashore in a gale, August 10, near Wainwright inlet, in latitude 70°. Three of the crew of the George and Susan were lost, but the catch of oil and bone was saved and brought down by the bark Ohio. The Corwin party themselves have accomplished some creditable exploring work during the season. Lieutenant Cantwell returned to his explorations of the Kowak River, while Assistant engineer McLenegan, his companion in 1884 (*Science* No. 98, p. 551), undertook the exploration of the Nunatok, or Noatok, River, a stream falling into Hotham inlet, near and west from the Kowak, and so far less known than the latter. The Inland, or Noatok, River had been supposed to be a more important stream than the Kowak until the investigations of Cantwell and Stoney threw a doubt on the matter. Stoney's party, whose preparations for wintering we have already noticed, sent a mail down by the Corwin, which left them near the head of Hotham inlet. The explorations of the present year were entirely

successful, and will be referred to again when details have been received.

Thoroddson contributes to *Globus* an account of his explorations in Iceland in 1884, which is more full and precise than the notes previously published. It appears that in a journey of ten weeks over the Odádrahraun desert and the adjacent mountains, about one-half was passed in an uninhabited region, much of which was completely unknown. He forced his way along the northern base of Vatna Jokúll, the journey being frequently hazardous and always laborious. Many corrections of heights were made, and it seems that Jökulsa, which has been taken as the longest Icelandic river, is exceeded by Thiörsa, which is some 120 miles in length. An ascent of the unvisited and important Dyngja volcano was made. It proved to have a double crater, the inner one being 600 feet or more in depth.

The autumnal exodus of the fleet from Alaskan and arctic waters brings letters and successive mails with a profusion which contrasts strangely with the one opportunity of midsummer or the want of any opportunity from October to March, west of Mt. St. Elias. The sealing schooner San Diego, which has had a thrilling history in Alaskan waters and was thought to have foundered this fall in a severe gale, has reported in good order. The coast survey steamer Patterson, which has been surveying in Alaskan waters during the summer, has put in to San Francisco, having encountered heavy gales on the way down. The whalers are reporting, after an unusually successful season; the first to appear being the Coral with 1,600 bbls. of oil and 16,000 pounds of whalebone. She brought a slab of baleen from the Alaskan right whale, captured off Kadiak, and now very rare, which excited the astonishment of old whalers. It was only six feet long, but weighed nine hundred pounds, and is said to be the heaviest on record from the Pacific. According to advices from Kadiak, of Sept. 22, that flourishing village of St. Paul had not to that date seen or heard anything official of the existence of the supposed territorial government, instituted nearly two years ago. No revenue cutter had visited them for three years, although this is the port of third importance in the territory, with a good commerce and boasting a deputy collector of customs. The salmon canning had ceased for the season; owing to the low price of fish, but 60,000 cases of salmon and boneless codfish had been put up, with about 1,000 barrels of salt salmon and a certain amount of smoked halibut. Reports from the other fishing stations and the outlying trading posts had not been received, but the harvest of furs and sea-otter skins was an excellent one wherever heard

from. Wreckage of oriental origin, including part of a vessel's rail with a money box cut into it and containing some Chinese coins, had been picked up on the shore of Montague Island, Prince William Sound. The season at Kadiak had been a fine one, the crop of potatoes and especially of cauliflowers being very successful, but at Iliamna trading station, Cook's Inlet, a freshet occurred during the summer, by which the course of a small stream was changed and the trader's house actually washed away. A gale in July at Cold Bay, on the peninsula, caught a sea-otter party of Aleuts far from land in their kayaks, and for forty-eight hours they were obliged to use their paddles to keep from foundering. Five were drowned. The volcano of St. Augustin in Cook's Inlet continues to emit smoke and steam from many fissures. Water is still very scarce there, but several white otter hunters have established themselves upon the island for the winter. In south-eastern Alaska the Treadwell or Paris mine is proving a great success. The new mill, numbering 120 stamps, sent down \$95,000 as the result of the first twenty-five days' work, and there is an almost unlimited quantity of low grade ore milling, net, about \$5.00 to \$8.00 gold per ton. This has stimulated work on the gold mines near Sitka, which are much richer but less extensive.

ASTRONOMICAL NOTES.

Meeting of the Astronomische gesellschaft.—*Nature* (xxxii., 516) gives a rather full account of the meeting of the Astronomische gesellschaft held at Geneva, August 19-22. Among about fifty members present we see the names of Struve, Newcomb, Christie, Auwers, Krueger, Tisserand, Weiss, and Schoenfeld. Reports were read on the present state of the computation of planetary orbits, on the zone work of the society, and on the photographic mapping of the stars of the Bonn *Durchmusterung* begun by Gill at the Cape. Professor Auwers read a paper by Professor Pickering on the photometric survey of the heavens, which was heard with especial interest; and Staatsrath Struve, in presenting photographs of the Pulkowa 30-inch refractor, expressed his complete satisfaction with the instrument. On the last day of the meeting addresses were made by Professor Gylden on the graphic representation of planetary orbits, by Professor Newcomb on perturbations and their numerical calculation, and by Dr. Mueller on modern photographic apparatus. Other papers were read by Professors Bakhuyzen, Seeliger, Safarik and Weiss. The subject of most general immediate interest was the discussion of the sixth resolution of the Washington meridian

conference, recommending a change in the beginning of the astronomical day. Struve, Folie and Pechüle seemed to be the only members in favor of the change, while Newcomb, Weiss, Krueger, Dunér, Auwers, Tietjen and Safarik, spoke in opposition to it. Professor Gylden thought it inexpedient to make the change at present, though he was of the opinion that, in twenty or thirty years hence, the majority of astronomers would be in favor of a universal time. The statement by Struve that in the Royal astronomical society the majority are in favor of the universal time, has been corrected by Mr. Downing of the Greenwich observatory, who says (*Nature* xxxii., 353) that "the Royal astronomical society as a body has not expressed any opinion on the subject. And judging from the individual expressions of opinion which have been published, I should imagine that here, as at Geneva, the majority of real workers in our science (with the probable exception of those engaged on solar work) would be opposed to the proposed change." No resolution in regard to the matter was passed by the gesellschaft. The next meeting will be held at Kiel in 1887.

Displacement of solar lines.—In order to obtain, if possible, further evidence upon the disputed question as to whether the displacements and distortions of lines in solar spectra are due to actual drag of masses of gas to or from us, sometimes calling for velocities of 400 or 500 km. per second, M. Trepied proposes, in the *Bulletin astronomique* for August, an arrangement of apparatus by which, after the light has passed through slit and collimator, the beam shall be divided so as to show two spectra superimposed at any desired point of either, thus allowing simultaneous optical examination, or micrometrical measurement, upon two lines from exactly the same part of the sun. He then proposes to test Fizeau's law that the ratio of displacement to wave-length, $\frac{\Delta\lambda}{\lambda}$, should be constant throughout the spectrum, for any one velocity of the luminous source to or from us. He will begin with the C and F lines of hydrogen, the ratio of whose wave-lengths is about 1.35 to 1.00. It would seem as if this difference should show plainly in the relative displacements, but it must be remembered that the largest of these take the form of very irregular distortions of the lines, and the different brightness and color of the lines and their background may perhaps differently affect their visible or measurable limits. His results will be awaited with interest.

Parallax of 40° Eridani.—Professor Hall publishes, in No. 2682 of the *Astronomische nachrichten*, the results of observations made in 1883 and 1884

to determine the annual parallax of the star 40 α^3 Eridani. The principal star of this system has a proper motion of 4" a year; and, at a distance of 83", there is a double companion, which has the same proper motion, while nearly between them is a small star which does not move. Professor Hall finds for the parallax of 40 Eridani

$$\pi = 0''.223 \pm 0''.0208.$$

a result rather smaller than might have been expected, but one which he considers worthy of considerable confidence.

Comet Tuttle (1790 II.).—Swift reports having found the comet on August 13. He describes it as "fairly bright on a dark sky, and shows a strong condensation at the centre." As far as we have learned, he is the only one who has seen the comet at this return, except the astronomers at Nice.

The nebula in Andromeda.—The new star in the Andromeda nebula continues to decrease in brightness. On October 10 it was estimated as 9.9 magnitude with the transit circle of the U. S. naval observatory. This estimate depends upon the same star used in the previous observations (*Science* vi., 310).

Comet 1881 III (b) Tebbutt.—Dr. de Ball intends to compute the orbit of the above comet, and calls for any observations still unpublished. Address, 'Dr. de Ball, Observatoire, Ougrée, Liège, Belgium.'

NOTES AND NEWS.

THE curriculum of the University of Michigan has been altered and enlarged in order to provide a specific course of study for students who wish to devote their time largely to biological work, either as a preparation for the study of medicine or with a view to teaching or engaging in biological research. Zoölogy, botany, and physiology are the most prominent subjects of the course, but full opportunity is given for extended work in physics, chemistry, paleontology, and other sciences.

—The first one of a course of ten lectures on physiology and hygiene, under the auspices of the Cincinnati society of natural history, was given on October 3. These lectures are free to teachers of the public schools, and the interest is shown by the application of about seventy-five teachers for tickets to the course. This is the second course given by the society, the first having been on botany.

—Cable dispatches announce the death of Thomas Davidson, preëminently the British student of Brachiopoda. He was born in Edinburgh, May 17, 1817, and received most of his education on the continent. A review of his latest work will

be found in *Science* (v., 409). The monograph of recent Brachiopoda, there referred to as in preparation, has actually been completed. Under date of June 1, in a letter to a friend in this country, which we have been permitted to see, he says that it will be accompanied by 80 plates, containing 865 figures, and adds: "I can assure you that this work has taken me a long time to complete, and, since I have been ill for several months, it is fortunate that all is ready to send to the printer. I have thus been able to bring to successful conclusion all that I had proposed to accomplish, and I am now ready to leave this world as soon as God wills." This indefatigable investigator adds that he has also completed a bibliography of the Brachiopoda which will occupy about 200 quarto pages and contain about 3400 titles; the first part will be printed by the Paleontographical society this year and the balance in the volume for 1886. "I have been able," he concludes, "to make a very rich and nearly complete collection of recent Brachiopoda, and I propose to bequeath the whole of this, as well as all my fossils, to the British museum."

—James Macfarlane, well-known for his useful 'Geological railway guide' and 'Geologist's travelling handbook,' died suddenly on the 12th instant at his home in Towanda, Penn., of heart disease. He was born Sept. 2, 1819, at Gettysburg, Penn.

—In the *Philosophical magazine* for August, Shelford Bidwell, Esq., in a paper entitled 'The sensitiveness of selenium to light and the development of a similar property in sulphur,' describes a series of very interesting experiments, which would seem to show that the action of light in varying the resistance of a selenium cell arises from the fact that the conductivity of the cell is due to a selenide of the metal with which it is annealed (the crystalline selenium itself being practically a non-conductor), and that the formation of this selenide is assisted by direct radiation of light. With sulphur and silver he formed cells showing the same variation of resistance in light and darkness, and showed very plainly that the union of sulphur and silver into the sulphide, at ordinary temperatures, is greatly assisted by direct radiation, and is not due to rise of temperature of the substances themselves. The whole analogy of the actions of sulphur and selenium in the two cases, coupled with the enormously high resistance of pure selenium when crystallized between glass plates or substances with which it does not combine, seem to render his conclusions highly probable. The whole paper is of great interest.

—The Russian government has just despatched one of the foremost mining authorities of the day, M. Gulishambaroff, to Askabad, in Central Asia,

to investigate the mineral treasures of the region. M. Gulishambaroff has made his name principally in writing on petroleum, which will be one of the subjects of investigation; but the sulphur deposits of the Turcoman desert are his main object. Specimens of fine iron ore have also been sent in from the Akhal oasis, and the extent of this is to be reported on. The Herat territory, which is contiguous to the new Russian acquisitions, is rich in minerals.

— The new Institute of hygiene founded in connection with Berlin university, and presided over by Dr. Koch, is so far advanced towards completion that lectures will be held in it this term. It is principally intended for the study of bacteriology.

— Prof. O. C. Marsh, of New Haven, discussed the size of the brain in extinct vertebrates before the British association recently; this is a subject which has engaged his attention for fifteen years. In every instance he found that the mammals from the lower tertiary had very small brains. He carried out his investigation into the upper tertiary, and found that the brain was much larger in the pliocene than in the miocene. All the tertiary mammals had small brains; there was a gradual increase in the size of the brain during this period; and this increase in the size was generally in the cerebral hemisphere or higher portions of the brain. In some groups the convolution of the brain had gradually become more complex. In some the cerebellum and the olfactory lobes had even diminished in size. There is now evidence that the same general law of brain growth holds good for birds and reptiles from the Jurassic period to the present time. The brain of an animal belonging to a vigorous race fitted for a long survival was larger than the average brain of that period in the same group; and the brain of a mammal of a declining race was smaller than the average brain of its contemporaries of the same group. The small animals now existing had proportionally larger brains than the larger animals, and young animals had proportionally larger brains than adult animals. They found some interesting examples which threw light on this question. For instance, in the eocene they had an animal, the oldest known ancestor of the rhinoceros, and it had an exceptionally large brain. Taking all the facts together, it seemed as though this brain growth was an important element in the survival of animals. If the animal became large and unwieldy with a small brain, it would be liable to suffer from any change of climate. In other words, in early times the big brain conquered, as it is the big brain that conquers in civilization to-

day. In the discussion which followed the paper, Professor Flower said it was satisfactory to find a case where the facts worked out coincided with previously-formed theories, because that was not always the case, and sometimes the facts or the theories had to go to the wall. In this case they had no such difficulty, and they had to thank the American government for the way it had taken up Professor Marsh's work and was disseminating it.

— A very convenient summary of the results obtained by the English society for psychical research and the tendency of their work is to be found in an article by Grace Peckham, M.D., entitled, 'A critical digest of the proceedings of the English psychical society.' It is published in the *Journal of nervous and mental disease* (New York) for July, 1885 (published in September).

— The Columbia college philosophical society is to be revived this winter. It was organized in 1882, and during that and the following winter held monthly sessions of much interest. Papers were read by Prof. Archibald Alexander, Prof. G. Stanley Hall of Johns Hopkins university, Prof. William M. Sloane of Princeton, Dr. Nicholas Murray Butler, Dr. Edward W. Hopkins, and others. The average attendance at these meetings was fifty, and an even larger attendance is hoped for this winter.

— The English and American societies for psychical research may receive some coöperation from the Société de psychologie physiologique just started in Paris. This society purposes making a study by observation and experiment of all phases of psychical activity, both normal and pathological. M. Charest is the first president, and MM. Janet and Ribot the vice-presidents of the society.

— The Russian papers announce that the section of the Transcaspian railway from Kizil Arvat to Askabad is almost complete, and that it may be expected to be formally opened at an early date. They are also asking whether the line is to stop at Burdalik, its ultimate destination on the Amu Daria, or whether it is to be carried beyond that place. A commission, composed of members of the different departments, has been appointed to investigate the subject.

— The portrait of Prof. Louis Agassiz, in our last number, was drawn by Robert Lewis from a large photograph by Sonrel, taken about 1865. Sonrel, it will be remembered, was an artist in the employ of Professor Agassiz, who afterwards, from failing eyesight, turned his artistic skill into the photographic field. The larger part of the plates in Agassiz's 'Contributions to the natural

history of the United States' were drawn from nature on stone by Sonrel.

WASHINGTON LETTER.

THE Chemical society, although one of the youngest, is by no means the least active of the scientific societies of Washington; in fact it will take a relatively high rank in that respect. It is presided over by Professor F. W. Clarke and its members number about forty. The first meeting for the season was held on the evening of the 8th of October. It happened that both the president and secretary were absent, but there was a good attendance of members and an interesting meeting was held. Mr. Chatard gave an informal account of his recent examination of the leading salt works of the country, together with a general discussion of the manufacture of salt in America. Mr. Chatard has been engaged for some time under the U. S. geological survey in the study of this question, especially with a view of determining whether any practical use can be made of the great alkali deposits which are so abundant in the United States, and it is likely that the subject will occupy his attention for some time to come.

It has sometimes been found difficult to provide interesting material for the 'first meetings' of societies here, for the reason that many of the active contributors to their proceedings have just returned from their summer campaigns and have had no leisure for working up the material which they have accumulated. The Chemical society was this year an exception to the rule and so, also, was the Philosophical society, which held its first meeting on the evening of Saturday, the 10th of October. Dr. Billings had provided an interesting programme in the exhibition and discussion of a large and valuable collection of anthropometric apparatus recently received at the Army and navy medical museum. A large part of it was a duplicate of what had been used by Galton in his laboratory, and a very interesting part had been manufactured in Germany by Mr. Cattell. It was understood that the latter involved some improvements on forms devised by Mr. Stanley Hall for the investigation of the time occupied in certain simple mental processes. By means of a sort of drop shutter, somewhat resembling a guillotine, the subject upon whom the experiment was being made was permitted to see for only an instant the object, the nature of which he was to determine as quickly as possible. The thing to be seen may be a card of a particular color, the subject being required to decide what color it is, or but two colors may be used and he may be required to decide which of the two appears. Diagrams of

different forms may be used, and the time occupied in judgment of form determined. Cards with various numbers of well defined dots on them may also be displayed, and the subject required to announce the number as determined from his instantaneous view of the card. In this way something may be known in regard to the maximum number of individual objects which one recognizes, or can correctly announce, without the operation of counting. It was stated that experiments conducted in this manner gave three as this maximum, which is certainly less than the result obtained by a different mode of experimentation. The apparatus was arranged to register the time intervals by means of a Hipp's chronoscope. Considerable discussion resulted from the exhibition of the instruments, and the use of a Hipp's chronoscope was criticised by several members. It is unquestionably complicated in its form and requires a good deal of skill and experience in its use. There are several modern methods of time measurement for small intervals which appear to excel it in simplicity of construction, ease of operation, and accuracy of performance. So much interest was manifested in this discussion that it was found necessary to postpone a paper on psychrometry by Mr. H. A. Hazen, which was on the programme for the evening, and it will be taken up at the next meeting.

Lieut. Cornwall of the Bureau of navigation, in charge of the 'division of compasses,' has gone to Mr. Roach's ship-yard at Chester, Penn., to make experiments on the magnetic constants of the new steel cruisers, Boston, Atlanta, and Chicago. The last is still unfinished and as its azimuth has been constant for some months, the investigation of its magnetism now, and again after launching, will doubtless be of much interest.

Within the past week the capital has been visited by Mr. Clements R. Markham, secretary of the Royal geographical society of London. His stay in the city was necessarily short, and he was unable to visit all of the centres of scientific activity in the city; but his brief visit was much enjoyed by those who had the pleasure of making his acquaintance.

Not everybody is aware of the interest which Professor A. Graham Bell has long taken in the instruction of deaf-mutes, or that he has for some time maintained an 'experimental' school for deaf children in this city. Mr. Bell has recently taken a very important step in the organization of a normal or training school for teachers in connection with this school for children. He is desirous of training young ladies who are thoroughly interested in this work, in the methods which he has devised, tested, and approved for instructing deaf-mutes, and especially in the methods of teaching

articulation, upon which subject Mr. Bell has bestowed a vast deal of time and study. But a limited number of teachers in training can be accommodated, and the opportunity is doubtless one which will be eagerly sought.

The national museum, Mr. Barnum, and the big elephant Jumbo, have all received a good deal of public notice arising from the singular death of the gigantic and lamented beast. The public was at first assured that the bones of this creature, fated to disturb two continents, were to rest in the national depository, although it was stated that the stuffed skin was to adorn the collection of a New England college. Recent information, however, seems to indicate that Mr. Barnum has awakened to the fact that he now has two Jumbos, instead of one, and that both may continue to be sources of profit for some time to come as parts of one or two travelling 'aggregations.' There is little doubt but that a year or two of this sort of an existence would greatly diminish the value of the skeleton of the elephant, and it is stated that the director of the national museum is in correspondence with Mr. Barnum with a view to prevent such a calamity, in which effort everybody wishes him success. Reference was made in the letter of two weeks ago to the large acquisitions of the museum through the New Orleans exposition. The curators of the various departments are getting some of these collections into shape, and although they are in some instances embarrassed by lack of space, some effective displays will be made. A very valuable, and, in some respects, typical collection was presented by the Japanese government, and has just been unpacked. It is intended to present an epitome of the arts and industries of the country, and as such it will doubtless be kept together for some time, and conspicuously displayed. It includes illustrations of the handicraft of the ingenious natives of Japan in pottery, porcelain, lacquer, bronze, silver, and copper, and also models and water-color sketches illustrating Japanese fisheries, domestic occupations and the like. Z.

Washington, D. C., Oct. 19.

LETTERS TO THE EDITOR.

* Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

An attempt to photograph the corona.

Mr. W. H. Pickering having courteously sent me a copy of *Science* (August 14), containing an article entitled 'An attempt to photograph the solar corona without an eclipse,' may I ask you to insert the few lines which follow in the next number of your journal?

Passing by all those points which are covered, directly or indirectly, by my reply to Mr. Pickering's first letter (*Science*, April 3), I find only two matters which I consider it necessary to notice.

1. Mr. Pickering says: "The inferiority of the best gelatine plates to the human eye in this respect [small differences of light] is very readily shown by an attempt to photograph distant mountains." He then goes on to say: "Another illustration of the same thing is the impossibility of photographing the moon in the daytime, when the sun is high above the horizon. Although the moon may be perfectly distinct to the eye, the negative shows no trace of it."

To your scientific readers, the reasons will readily suggest themselves, why, in the case of the moon in the daytime at some angular distance from the sun, the eye has an advantage over the plate, while, in the case of the corona, the plate has a great advantage over the eye. Apart from any such considerations, as a matter of fact, there is no difficulty in photographing the moon at noonday. Yesterday I took, with the apparatus used on the corona, four negatives on bromide plates (Edward's), between 11.30 A.M. and noon, in full sunshine. On all the plates, the moon is very distinct and well defined. The moon at noonday, unless too near the sun, is an easier object to photograph than the corona. It is obvious, therefore, that photographic methods, which are not delicate enough for the moon, must utterly fail if applied to an object still more difficult, as the corona undoubtedly is at ordinary elevations.

If Mr. Pickering's statement of the 'impossibility' of photographing the moon under the conditions already named, rests upon his own experiments, some light may come upon a point which has occasioned me surprise, namely, that Mr. Pickering does not appear to get upon his plates the defects of his own apparatus; for example, those of the position of his shutter and those of his spectacle lens. In some experiments I made with a shutter similarly placed, very strong diffraction effects appeared on the plates, effects stronger than any photographic action which could be supposed to be due to the corona.

2. With regard to Mr. Pickering's experiments, I would point out that the conclusion to which they lead him, namely, "It therefore seems that even in the clearest weather the reflected light of the atmosphere is 300 times too strong to obtain the faintest visible image of the true coronal rays," appears to me to be irreconcilable with the direct observations of Professor Langley and others of the planets Mercury and Venus, as black disks before they reach the sun. Professor Young says: "Of course this implies behind the planet a background (of corona) of sensible brightness in comparison with the illumination of our atmosphere." (The sun, p. 229.)

The Bakerian lecture read recently before the Royal society, in which I have discussed some of these points more fully, will be in print in a few weeks. The photographic method is now being tried at the Cape of Good Hope, under the scientific conditions I have pointed out as essential, by Mr. Ray Woods, under the able superintendence of Dr. Gill, F.R.S.

WILLIAM HUGGINS.

From the above interesting communication by Dr. Huggins I regret to find that he has failed to see my reply published in *Science*, for April 29, to his letter of April 13. My experiments on the position of the drop-shutter were there taken up with some detail. Also other points presumably referred to in the beginning of his article are discussed.

As to the observations of the planets Mercury and Venus, as black disks before they reach the sun; the

explanation usually given¹ of this phenomenon is that it is due to the refraction of the sun's rays passing through their atmospheres, and thus illuminating rather more than one hemisphere at a time. Any small body surrounded by a ring of light would naturally appear darker by contrast than the surrounding background.

In regard to photographing the moon in the daytime, it may be as well to call attention first to the fact, that as the moon and sky are nearly of the same brilliancy, and there are accordingly no irradiation effects, it is not a question of the best form of apparatus, but almost entirely of the contrast qualities of the plate and developer employed. In fact an ordinary camera furnished with a long focussed landscape lens is as good an instrument as can be devised for this investigation. Fortunately I had on hand some of Edwards's bromide plates, imported last June, and they, together with some Carbutt B. and Anthony chloride plates, were employed in the following determinations.

It should also be stated in regard to my remark, reading "the impossibility of photographing the moon in the daytime, when the sun is high above the horizon," that this was merely a general statement, founded on observations made in June and July when the sun's altitude in the middle of the day was between 60° and 70°.

Dr. Huggins has now shown that this statement is not rigidly exact, as with the sun at an altitude of 35°, and the moon in the most favorable position at this season (the third quarter), he has obtained a distinct image upon his plates. I repeated his experiment, October 16 and 17, when the moon was in the first quarter, and with the sun at an altitude of 18° obtained a similar result. The images, though distinct, were far too faint to print, and only two plates out of nine showed any image at all, although the moon was very conspicuous to the eye. I should consider it doubtful if photographs of the moon could be obtained with the sun at an altitude of over 60°. If then there is difficulty in obtaining an impression of the moon at 90° distance from the sun, how much more difficult would it be to photograph the still fainter coronal rays, when masked by the dazzling brilliancy of our atmosphere in the sun's immediate neighborhood.

But what particularly interested me in Dr. Huggins's communication was, that I saw at once that it furnished me a new constant, and accordingly a new method, for determining the relative light of the atmosphere near the sun, and the corona. Five separate measurements were made between 1.15 and 4.15 on October 16 and 17, of the relative light of the sky in the immediate vicinity of the sun and moon, by the photographic method described in a previous paper.² These ratios varied from 16, when the sun was highest, to 50 at the later hour. Taking the average of these values, we may safely assume that between three and four o'clock, when my successful pictures of the moon were taken, the light about the sun is generally not far from 35 times as bright as the light of the sky in a region where it is just possible to photograph the moon. But according to the observation of Prof. S. P. Langley, previously quoted, the light of the moon is ten times that of the corona at 3' distance from the sun. Accordingly the light of the atmosphere in the immediate vicinity of the sun would have to be reduced

350 times in order to obtain an impression of the corona upon our plates. If the sun were at a greater altitude, this figure would be somewhat smaller. The value found by my previous experiments was 320. The closeness of the coincidence is probably accidental, but of the two methods the first one seems to me rather the more accurate.

WM. H. PICKERING.

Voss-Holtz electrical machine.

In response to Mr. Eaton's communication in *Science*, No. 141, I would say that, about a year ago, I compiled for one of my classes a discussion of the Voss-Holtz electrical machine. Some months afterward Mr. E. B. Benjamin prepared a pamphlet regarding his machines, and asked my permission to incorporate what I had given my students regarding the theory of these. I granted his request, though not satisfied with the completeness of the discussion. What I had written had not been intended as a contribution to science, and I did not deem it of sufficient importance to quote authorities. Before putting my compilation on paper, I had consulted Ferguson, Silvanus Thompson, Ganot, Desehanel, some articles by Dr. Atkinson of Chicago, and the article in *Science* by Mr. H. W. Eaton. I cheerfully express my obligation to all of these writers. Mr. Eaton's article was specially helpful. As I claimed no originality, there was no attempt or wish to deprive him of any credit due.

The greater part of Mr. Benjamin's pamphlet was written by himself.

W. LE C. STEVENS.

Brooklyn, Oct. 19.

Recent Proceedings of Societies.

Academy of natural sciences, Philadelphia.

Botanical section, Oct. 12.—Mr. Aubrey H. Smith described the flowering of *Gordonia pubescens* in Bartram's garden and gave a history of the species.—Mr. John Redfield spoke of the topographical features of Martha's vineyard and Nantucket, in connection with the flora of those islands. The northern part of the former rises into rounded gravelly hills of considerable elevation, composed of gravel drift, with occasional large boulders. They are evidently of glacial origin. The more central portion consists of level plains of gravel covered with oak, mostly *Quercus obtusiloba*. The general character of the flora is much like that found on the summit of the divides in southern New Jersey, though much more limited as to species. Farther south, extensive ponds both of fresh and salt water introduce their characteristic vegetation. In Nantucket he had found the gravelly hills of much less height, the greater portion of the island consisting, in fact, of treeless plains. One extensive grove of *Pinus rigida* exists in the central portion, and is known to have been planted. The most characteristic plants of the plains seemed to be bear-berry, *Arctostaphylos uva-ursi*, which grows there in great profusion. The two species of *Hudsonia* abound, the *Herioides* being seen everywhere, and less frequently the bluish tufts of *H. tomentosa*. *Polygalae polygama*, *Myrica*, *cerifera*, and various *vaccinae* abound. He saw many large patches of *Corema Conradii*, the existence of which in Nantucket had first been made known by Mrs. Owen of Springfield, Mass. But the most inter-

¹ Newcomb's *Astronomy*, p. 290. ² *Science*, Aug. 14.

esting feature of the Nantucket flora is the existence of three species of heath under circumstances that lead to the belief that they are indigenous. Mr. Redfield has not seen the locality of *Colluna vulgaris*, but had seen that of *Erica cinerea*. The latter has been known and watched for ten or twelve years and is evidently long established. It grows in the open common, far away from the town, and there is nothing about its surroundings to indicate human introduction. It covers only a space of eight inches by ten. Since Mr. Redfield's visit he had learned that another and possibly a third locality of heath had been discovered widely distant from the first, and that in one case the species proved to be *Erica tetralix*. He held that the discovery of so many species, and these the same as are found associated in England, pointed strongly to an indigenous origin. Mr. Meehan in continuation described the associated growth of the three species of heath on the Isle of Wight.

Calendar of Societies.

Philosophical society, Washington.

Oct. 10.—Drs. J. S. Billings and Washington Matthews, Exhibition of anthropometric and reaction time apparatus.

Society of arts, Boston.

Oct. 22.—Mr. W. W. Jacques, Recent progress in underground wires.

Boston society of natural history.

Oct. 21.—Dr. S. Kneeland, Two memorial grave-stones of the iron age, from central Sweden, bearing Runic inscriptions and other symbols.

Natural history society, Agricultural college, Mich.

October meeting.—Election of officers: G. W. Park, president; F. C. Davis, vice-president; H. L. Chapin, secretary; L. G. Carpenter, treasurer; W. H. Clemons, curator. Chairmen of sections: Agriculture, Prof. S. Johnson; astronomy, L. G. Carpenter; botany, Dr. W. J. Beal; chemistry, F. S. Kedzie; scientific method, Prof. L. McLouth; zoölogy, Prof. A. J. Cook.

Oct. 11.—J. B. Cotton, Parasites of *Pieris rapae*; W. G. Everhart, Contents of a drop of water; W. K. Clute, Unconscious bias in walking; A. B. Sudworth, A talk about mosses.

Publications received at Editor's Office, Oct. 12-17.

- Balling, C. A. M. Die metalhüttenkunde. Berlin, Springer, 1885. 22+627 p., illustr. 8°. (New York, Stechert, \$3.70.)
 Barus, C. and Strouhal, V. The electrical and magnetic properties of the iron-carburets. Washington, Government, 1885. (Bull. U. S. geol. surv. 14.) 238 p., illustr. 8°.
 Beckert, T. Leitfaden zur eisenhüttenkunde. Berlin, Springer, 1885. 8+416 p., 3 pl., illustr. 8°. (New York, Stechert, \$3.30.)
 Benoit, M. J. R. Construction des étalons prototypes de résistance électrique du ministère de postes et des télégraphes. Paris, Gauthier-Villars, 1885. 80 p. 4°. (New York, Christern, \$1.50.)
 Bichat, M. E. et Blondlot, M. R. Instruction à l'étude de l'électricité statique. Paris, Gauthier-Villars, 1885. 10+141 p., illustr. 8°. (New York, Christern, \$1.35.)
 Böhn, C. Die landmessung. Heft I. Berlin, Springer, 1886 (1885). 236 p., illustr. 8°. (New York, Stechert, \$4.40.)
 Brongniart, C. Les insectes fossiles des terrains primaires. Rouen, impr. Lecroix, 1885. [24 p.], 5 pl. 8°.
 Chevallier, A.-F. et Muentz, A. Problèmes de physique avec

- leurs solutions développées. 2d ed. Paris, Gauthier-Villars, 1885. 8+205 p., illustr. 8°. (New York, Christern, \$2.)
 Congrès géologique international, 11ème session, Berlin, 1885. Membres présents. Berlin, Sittenfeld, fr., 1885. 9 p. 8°.
 Curtius, G. Zur kritik der neuesten sprachforschung. Leipzig, Hirzel, 1885. 161 p. 8°. (New York, Stechert, \$1.)
 Delbrueck, B. Die neueste sprachforschung. Betrachtungen über Georg Curtius schrift zur kritik der neuesten sprachforschung. Leipzig, Breitkopf & Hartel, 1885. 49 p. 8°. (New York, Stechert, 40 cents.)
 Doolittle, C. L. A treatise on practical astronomy, as applied to geodesy and navigation. New York, Wiley, 1885. 10+642 p., illustr. 8°. \$4.
 Faye, H. Sur l'origine du monde. Théories cosmogoniques des anciens et des modernes. 2d ed. Gauthier-Villars, 1885. 12+309 p., illustr. 8°. (New York, Christern, \$2.)
 Forel, F. A. La formule des seiches. Genève, Arch. sc., phys. nat., 1885. 12 p. 8°.
 Gieseler, E. A. On tidal theory and tidal predictions. Philadelphia, Frankl. inst., 1885. 61 p. 8°.
 Gretscher, H. and Bornemann, G. Jahrbuch der erfindungen. Leipzig, Quandt & Händel, 1885. 6+405 p., illustr. 12°. (New York, Stechert, \$2.20.)
 Halsted, G. B. The elements of geometry. New York, Wiley, 1885. 16+166 p., illustr. 8°. \$1.75.
 Hermite, M. C. Sur quelques applications des fonctions elliptiques. Fasc. I. Paris, Gauthier-Villars, 1885. 146 p. 4°. (New York, Christern, \$2.50.)
 Holder, C. F. Marvels of animal life. New York, Scribner's Sons, 1885. 10+240 p., illustr. 8°. \$2.
 Homan, G. ed. A sanitary survey of St. Louis, being a series of short papers on leading public health topics contributed by city officials and local sanitarians. Concord, N. H., Repub. pr. ass., 1885. 77 p., 3 maps. 8°.
 Huyghens. Traité de la lumière. Edited by W. Burchardt. Lipsiae, Gressner & Schramm. 4+134 p., illustr. 8°. (New York, Stechert, \$2.20.)
 Jordan, W. Grundzüge der astronomischen zeit- und ortbestimmung. Berlin, Springer, 1885. 8+364+26 p., illustr. 8°. (New York, Stechert, \$3.70.)
 Justus Perthes in Gotha, 1785-1885. [Gotha, 1885.] 108 p., portr. 4°.
 Karlowa, O. Römische rechtsgeschichte. Band I: Staatsrecht und rechtsquellen. Leipzig, Von Veit, 1885. 8+1031 p. 8°. (New York, Christern, \$9.55.)
 Krenkel, M. Klassische bühnendichtungen der spanier. II. Calderon, Der wundertätige zauberer. Leipzig, Barth, 1885. 20+349 p. 8°. (New York, Stechert, \$2.)
 Laughlin, J. L. The study of political economy. New York, Appleton, 1885. 153 p. 12°.
 Le Conte, L. J. Are not dynamite catastrophes intimately associated with electric phenomena? (Tech. soc. Pacif. coast-2) 1885. 8°.
 Leray, Le P. A. Essai sur la synthèse des forces physiques. Paris, Gauthier-Villars, 1885. 10+180 p., illustr. 8°. (New York, Christern, \$1.65.)
 Lipsius, R. A. Philosophie und religion. Neue beiträge zur wissenschaftlichen grundlegung der dogmatik. Leipzig, Barth, 1885. 319 p. 8°. (New York, Stechert, \$1.90.)
 Mascart, E. and Joubert, J. Lehrbuch der elektricität und des magnetismus. Autorisierte deutsche übersetzung von Dr. L. Levy. Band I. Berlin, Springer, 1886 (1885). 20+592 p., illustr. 8°. (New York, Stechert, \$5.20.)
 Meyer, A. M. On a method of precisely measuring the vibratory periods of tuning forks, with special reference of these facts and laws to the action of a simple chronoscope. (Mem. Nat. acad. sc. 3.) 17 p., 4 pl. 4°.
 Moore, E. H., jr. Extensions of certain theorems of Clifford and of Cayley in the geometry of n dimensions. New Haven, Conn., Acad. sc., 1885. 18 p. 8°.
 Newbery, J. C. The examination of waters. Melbourne, Mason, Firth & McCutcheon, fr., 1885. 9 p. 16°.
 Normand, J. A. Etude sur les torpilleurs. Paris, Gauthier-Villars, 1885. 88 p. 4°. (New York, Christern, 70 cents.)
 Packard, A. S. On the structure of the brain of the sessile eyed Crustacea. (Mem. Nat. acad. sc. 3.) 14 p., 5 pl. 4°.
 Scudder, S. H. Descriptions of an articulate of doubtful relationship from the tertiary beds of Florissant, Col. (Mem. Nat. acad. sc. 3.) 6 p. 4°.
 Van Rysselberghe, M. F. Téléphone et télégraphie simultanées. Précédé de notions préliminaires sur l'induction électrique, le téléphone et le microphone par E. Buels, Bruxelles, Hayes, fr., 1885. 12+226 p., 7 pl. 12°. (New York, Christern, \$1.65.)
 Weygoldt, G. P. Die Platonische philosophie nach ihrem wesen und ihren schickalen für höhergebildete aller stände. Leipzig, Schöns, 1885. 6+256 p. 12°. (New York, Stechert, \$1.10.)
 Wuelker, R. Grundriss zur geschichte der Angelsächsischen literatur, mit einer übersicht der Angelsächsischen sprachwissenschaft. Leipzig, Von Veit, 1885. 12+532 p. 8°. (New York, Christern, \$3.70.)